IN THE CLAIMS:

1. (Original) A method, executed in an apparatus, for encoding an ~~perceptual model for determining Noise Masking Ratios, NMRs, for~~ audio signals $x(t)$ in each cochlear filter band, the method comprising

determining a representation of the envelope of the part of said x(t) that is inside a particular cochlear filter band,

quantifying a roughness measure for said envelope,

mapping said roughness measure to a NMR for the part of the signal that is inside said particular cochlear filter band, and

employing said NRM for the part of the signal that is inside said particular rr filter band to quantize modified discrete cosine transform (MDCT) coefficients of said audio signal.

2. (Original) The method of claim 1 wherein said determining a representation of the envelope comprises determining *e(t)*, the square of said envelope.

3. (Original) The method of claim 1 wherein said determining a representation of said envelope comprises determining $\tilde{X}(f)$, where $X(f)$ is the Fourier transform of $x(t)$, and $\tilde{X}(f)$ is the Fourier transform of the analytic signal corresponding to $x(t)$, $\tilde{X}(f)$ being a single sided frequency spectrum defined as

$$\tilde{X}(f)=\begin{cases}0 & f<0\\ X(f) & f=0\\ 2X(f) & f>0\end{cases}$$

for f extending over a frequency range associated with a human cochlea.

4. (Original) The method of claim 3 further comprising

filtering said $\tilde{X}(f)$ by a cochlear filter, $H_i(f)$, for $i = 1, 2, \ldots$ N to form representations of said single-sided frequency spectrum for N discrete bands of said frequency range, said representations given by

$$\tilde{X}_i(f)=\tilde{X}(f)H_i(f).$$

5. (Currently Amended) The method of claim 4 wherein said determining said envelope further comprises determining $e_i(t)$ for said N discrete bands in accordance with

$$e_i(t) = F^{-1}\left\{\int \tilde{X}_i(\varepsilon)\cdot\tilde{X}_i^*(\varepsilon - f)\,d\varepsilon\right\}$$

where $e_i(t)$ is the square of said signal envelope corresponding to the ith cochlear filter band having a characteristic frequency f_i.

6. (Original) The method of claim 5 wherein said quantifying a roughness measure for said envelope comprises performing a linear prediction of said envelope, $e_i(t)$ for each i to determine corresponding banded roughness measures $r_s(i)$.

7. (Original) The method of claim 6 wherein said mapping said roughness measure to a NMR comprises normalizing said $r_s(i)$, for each i, with respect to a roughness measure for a pure tone, $r_t(i)$, for each i, to form a normalized roughness measure for each i.

8. (Original) The method of claim 7 wherein said mapping said roughness measure to a NMR further comprises squaring said normalized roughness measure for each i to form a squared roughness measure for each i.

9. (Original) The method of claim 8 wherein each said squared roughness measure is raised to the 4^{th} power to reflect cochlea compression.

10. (Original) The method of claim 6 wherein said mapping said roughness measure for each cochlear band i to a NMR comprises determining

$$NMR_i = c\cdot\left[\frac{r_s(i)}{r_t(i)}\right]^8,$$

where $r_t(i)$ is the roughness measure for a pure tone for each i, and c is a constant.

11. (Original) The method of claim 10 wherein said constant, *c*, is determined by performing a linear prediction of the envelope, $e_i(t)$ for each i for a white noise input signal, thereby determining corresponding banded roughness measures $r_n(i)$ substituting said $r_n(i)$ values for $r_s(i)$ in

$$NMR_i = c \cdot \left[\frac{r_s(i)}{r_t(i)} \right]^8 ,$$

substituting known theoretical values for NMR_i for white noise in the immediately preceding equation, thereby determining a value, c_i, for each i, and averaging said values of c_i for all i to determine said value for c.

12. (Currently Amended) A method, executed in an apparatus, for coding audio signals $x(t)$ in the frequency domain, the method comprising

for each band of a cochlear filter having a plurality of bands

determining a representation of the envelope of the part of said x(t) that is inside a particular cochlear filter band,

quantifying a roughness measure for said envelope,

mapping said roughness measure to a Noise Masking Ratio, NMR, for the part of $x(t)$ that is inside said particular cochlear filter band, and

quantizing said audio signals in the frequency domain using said NMRs to determine quantizing levels.

13. (Original) The method of claim 12 wherein said determining a representation of the envelope comprises determining *e(t)*, the square of said envelope.

14. (Original) The method of claim 12 wherein said determining a representation of said envelope comprises determining $\tilde{X}(f)$, where $X(f)$ is the Fourier transform of $x(t)$, and $\tilde{X}(f)$ is the Fourier transform of the analytic signal corresponding to $x(t)$, $\tilde{X}(f)$ being a single sided frequency spectrum defined as

$$\tilde{X}(f)=\begin{cases}0 & f<0\\ X(f) & f=0\\ 2X(f) & f>0\end{cases}$$

for f extending over a frequency range associated with a human cochlea.

15. (Original) The method of claim 14 further comprising filtering said $\tilde{X}(f)$ by a cochlear filter, $H_i(f)$, for $i = 1, 2, \ldots$ N to form representations of said single-sided frequency spectrum for N discrete bands of said frequency range, said representations given by

$$\tilde{X}_i(f)=\tilde{X}(f)H_i(f).$$

16. (Currently Amended) The method of claim 15 wherein said determining said envelope comprises determining $e_i(t)$ for said N discrete bands in accordance with

$$e_i(t)=F^{-1}\left\{\int \tilde{X}_i(\varepsilon)\cdot\tilde{X}_i^*(\varepsilon-f)d\varepsilon\right\}$$

where $e_i(t)$ is the square of said signal envelope corresponding to the ith cochlea<u>r</u> filter band having a characteristic frequency f_i.

17. (Currently Amended) The method of claim <u>16</u> ~~17~~ wherein said quantifying a roughness measure for said envelope comprises performing a linear prediction of said envelope, $e_i(t)$ for each i to determine corresponding banded roughness measures $r_s(i)$.

18. (Original) The method of claim 17 wherein mapping said roughness measure to a NMR comprises normalizing said $r_s(i)$, for each i, with respect to a roughness measure for a pure tone, $r_t(i)$, for each i, to form a normalized roughness measure for each i.

19. (Original) The method of claim 18 wherein said mapping said roughness measure to a NMR further comprises squaring said normalized roughness measure for each i to form a squared roughness measure for each i.

20. (Original) The method of claim 19 wherein each said squared roughness measure is raised to the 4^{th} power to reflect cochlea compression.

21. (Original) The method of claim 19 wherein said mapping said roughness measure for each cochlear band i to a NMR comprises determining

$$NMR_i = c \cdot \left[\frac{r_s(i)}{r_t(i)} \right]^8,$$

where $r_t(i)$ is the roughness measure for a pure tone for each i, and c is a constant.

22. (Original) The method of claim 21 wherein said constant, c, is determined by

performing a linear prediction of the envelope, $e_i(t)$ for each i for a white noise input signal, thereby determining corresponding banded roughness measures $r_n(i)$ substituting said $r_n(i)$ values for $r_s(i)$ in

$$NMR_i = c \cdot \left[\frac{r_s(i)}{r_t(i)} \right]^8,$$

substituting known theoretical values for NMR_i for white noise in the immediately preceding equation, thereby determining a value, c_i, for each i, and

averaging said values of c_i for all i to determine said value for c.